



JULY 2015

SPACE LAUNCH SYSTEM HIGHLIGHTS

NASA's Space Launch System Design 'Right on Track' for Journey to Mars

NASA's Space Launch System Program Manager Todd May and others on the critical design review team pore over hundreds of design and development documents on the initial 70-metric-ton (77-ton) configuration referred to as SLS Block 1. In late July, the SLS Program completed its critical design review — a first in almost 40 years for a NASA exploration class vehicle. SLS Program managers will present the results from the critical design review board and Standing Review Board to Marshall's Center Management Council. After receiving the council's concurrence, the results then will be briefed to the Human Exploration and Operations Mission Directorate at NASA Headquarters. Read the full story on the critical design review. (NASA/MSFC)

(continued on page 2)



‘Right on Track’ (cont’d)



The critical design review team, including members of the Standing Review Board, listen to presentations during the SLS critical design review. (NASA/MSFC)



Artist concept of the SLS Block 1 configuration. (NASA/MSFC)

Pedal to the Metal – RS-25 Engine Revs Up Again



In auto racing parlance, NASA engineers put the “pedal to the metal” during a July 17 test of the RS-25 rocket engine at NASA’s Stennis Space Center. During a 535-second test, operators ran the RS-25 through a series of power levels, including a period of firing at 109 percent of the engine’s rated power. Data collected on performance of the engine at the various power levels will aid in adapting the former space shuttle engines to the new SLS vehicle mission requirements, including development of an all-new engine controller and software. Two additional tests of the RS-25 engine are planned before the current test series concludes by early September, and a new test series begins on four engines for a future flight. Check out all the colors the RS-25 creates **when it fires up.** (NASA/Stennis)

Spaceflight Partners: Ensign-Bickford Aerospace & Defense Co.

EDITOR'S NOTE: Every month, Space Launch System Highlights turns the spotlight on one of the many industry partners helping to create the largest rocket ever built for human space exploration. In this issue, we profile Ensign-Bickford Aerospace & Defense Co. of Simsbury, Connecticut.

Ensign-Bickford Aerospace & Defense Co. (EBA&D), headquartered in Simsbury, Connecticut, is a global provider of highly engineered solutions that combine pyrotechnics materials, mechanisms, structural members and control electronics for several of the nation's most critical assets. Its products are used on satellites, launch vehicles, human space, strategic and tactical missiles, and soldier and Special Forces platforms.

Recently, EBA&D performed tests on various components that will be used for SLS as part of a risk-reduction effort for future flights.

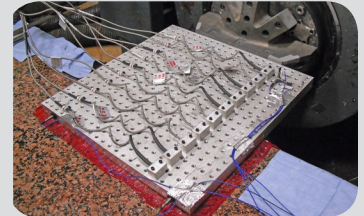
EBA&D helps in furthering spaceflight by manufacturing and testing Confined Detonating Fuse Manifolds (CDFMs) and Confined Detonating Fuse Assemblies (CDFAs) that will be used on the first flight of SLS. These items are heritage shuttle pyrotechnic devices used by the SLS Separation System to transfer signals and initiate events that simultaneously separate both boosters from the core stage.

As a first step in verifying the hardware was suitable for the SLS boosters, EBA&D conducted risk-reduction testing — subjecting them to thermal, vibration and shock environments prior to functioning.

In order to ensure reliability aboard the SLS, each facet of the rocket must be subjected to intense testing. To verify how different parts function under the different stresses and pressures associated with launch and flight, EBA&D simulates the worst-case environments and conducts tests to ensure the performance of various parts. This risk-reduction effort and testing were the first steps toward ensuring that heritage shuttle devices would work properly under the stresses that will be part of a SLS flight.

EBA&D also performed a related test on the Flexible Confined Detonating Cord Assemblies (FCDCA), which

Flexible Confined Detonating Cord Assemblies undergo risk-reduction testing at Ensign-Bickford Aerospace & Defense Co. (Ensign-Bickford)



are currently used on the SLS booster Flight Termination System that terminates thrust and distributes booster propellant in the event of an anomaly. FCDCA's will also replace the heritage shuttle devices on the Separation System after the second SLS flight. FCDCA's are the industry standard and serve the same purpose as the heritage CDFAs and CDFMs which were unique to the Shuttle design.

The new pyrotechnic devices are lighter and more cost effective than the heritage shuttle devices. Due to environmental exposure, the fuse encased in FCDCA can develop fatigue cracks. EBA&D conducted risk-reduction testing, and it was verified that no significant fatigue cracking was caused by the SLS mission environments, and the FCDCA's would function properly after exposure.

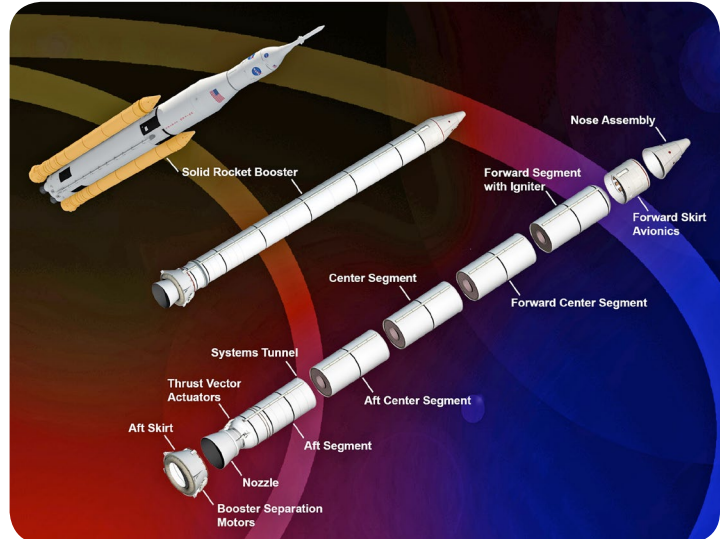
"Orbital ATK has enjoyed a working relationship with EBA&D for more than 20 years, and we greatly appreciate the hard work and dedication they exhibit," said Fred Brasfield, Orbital ATK's vice president of NASA Operations. "They perform crucial functions and the design, qualification, fabrication and testing ensures the products we use for SLS are of the highest quality possible."

"As the provider of the ordnance signal transfer system for our Flight Termination System, EBA&D is a vital partner and team member to Orbital ATK," Brasfield added. "Qualification of our Flight Termination System is key to overall certification of the SLS booster. EBA&D has a proven track record for providing on-time delivery of highly reliable, cost-effective ordnance products to the launch industry."

Aft Segment Cast for Second SLS Booster Qualification Test



Artist
concept of
the different
parts of the
SLS booster.
(NASA
MSFC) ▶



◀ The aft segment for a full-scale version of a five-segment solid rocket booster for SLS has been cast at Orbital ATK's facility in Promontory, Utah. The aft segment will eventually be integrated with the other four booster segments for a second booster qualification test, scheduled for 2016. The first SLS qualification test for the booster was successfully completed **March 11** at Orbital ATK. The second test will support qualification by specifically assessing performance at the cooler end of the motor's accepted propellant temperature range. After qualification is complete, the boosters will then be ready to proceed toward the first flight of SLS. Orbital ATK is the prime contractor for the boosters. Learn more about the **boosters**. (*Orbital ATK*)

Space Camp Hall of Fame

SLS Program Manager Todd May speaks to attendees at the Space Camp Hall of Fame Induction Ceremony on July 25 at the U.S. Space & Rocket Center in Huntsville, Alabama. (USSRC)



Construction 'Fueling' Up for SLS Core Stage Hydrogen Tank

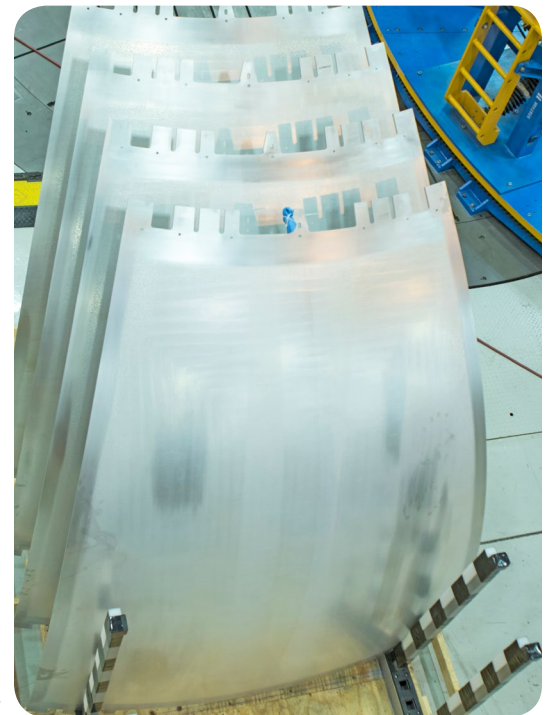


▲ Boeing technicians use cranes and specially designed lift fixtures to move a dome cap onto the **Circumferential Dome Weld Tool** for welding to the dome and a ring, forming a completed end cap for the SLS core stage hydrogen fuel tank. (Boeing)



▲ A Boeing weld technician inspects a recent weld on the **Gore Weld Tool** at NASA's Michoud Assembly Facility in New Orleans. The Gore Weld Tool is used to perform vertical conventional friction-stir welds in the production of gore assemblies for NASA's Space Launch System core stage hydrogen fuel tank — currently under construction at Michoud. All of the hardware necessary for building the tank that will be used on the first flight of SLS has been delivered to the facility and is awaiting assembly. Boeing is the prime contractor for the SLS core stage, including avionics. (Boeing)

Gore panels, provided to Boeing by supplier MT Aerospace of Germany, are stacked and ready for welding on the **Gore Weld Tool** at Michoud. Gore panels are aluminum alloy dome segments. They are welded together to form a dome — the end cap to the SLS core stage hydrogen fuel tank. (Boeing) ▶



The Force Was With Us at San Diego Comic-Con 2015

SLS was part of sharing NASA's Journey to Mars July 8-12 at San Diego Comic-Con 2015, which drew more than 150,000 people daily. SLS Program Manager Todd May also participated in a panel on that ambitious journey with Aditya Sood, executive producer of the upcoming film "The Martian"; Jim Green, director of planetary sciences at NASA; NASA astronaut Victor Glover; and Andy Weir, author of "The Martian."

"There are thousands of people in 46 states around this country working on this, and we're getting this rocket ready," May said.
(All photos NASA/MSFC)



On the Road...



NASA was in New Orleans July 1-5 for NASA Week, a celebration of space exploration in conjunction with the annual Essence Festival. (NASA/Stennis)



SLS propulsion engineer Kathryn Crowe, center, talks rockets during the "Rocket Women" panel July 25 at EAA AirVenture in Oshkosh, Wisconsin. (NASA/MSFC)

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#JOURNEYTOMARS



FACES OF SLS

Nyla Trumbach

Bees and RS-25 engine testing get this engineer's adrenaline pumping! Meet Nyla Trumbach, test operations engineer at NASA's Stennis Space Center.



Stennis Space Center

Read [Nyla's story](#).

SLS on Deck:

- Pegasus barge modifications complete
- Last SLS core stage flight dome delivered to Michoud
- RS-25 NASA Social